# Integrated modeling of core, edge and peripheral plasmas

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Since the edge region of toroidal plasmas is mainly characterized by the balance between the cross-field transport in core plasmas and the parallel transport and atomic processes in peripheral plasmas, integrated modeling including core, edge, and peripheral plasmas is required to describe the time evolution of the spatial structure of the edge plasma.

One simple approach is to extend a one-dimensional core transport code to the peripheral region. The dynamic transport code TASK/TX solves the flux-surface-averaged multi-fluid equations coupled with Maxwell's equations and self-consistently describes the plasma rotation and the radial electric field $E_r$ [1,2]. The parallel loss along the field line is included in the SOL region. By the use of the CDBM transport model [3] including the $E_r$ shear stabilizing effect, the condition for H-mode transition and the rotation of impurity ions are examined. It has been also applied to the helical plasma in LHD and transport mode transition due to the increase of heating power is observed. An improved modeling for the SOL-divertor plasmas based on the dynamic five-point model [4] will be also reported.

More advanced approach employs two-dimensional transport codes for SOL-divertor plasmas. The B2SOLPS5.2 code has been applied to the modeling of ITER H-mode [5]. The SONIC code has been coupled with a one-dimensional core transport code in the integrated tokamak modeling code TOPICS-IB [6]. It is also coupled with the integrated code TASK [7] and the behavior in H-mode with the CDBM transport model will be reported.

It is a natural extension to develop a full two-dimensional transport code which solves a set of two-dimensional transport equations in both core and peripheral plasmas. Though the development is still under way, some preliminary results will be presented.

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